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USES OF OUTER SPACE

# REPORT OF THE UNITED NATIONS EXPERT ON SPACE APPLICATIONS

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## INTRODUCTION

1. At its thirty-second session, held at Vienna from 6 to 17 February 1995, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space (COPUOS) reviewed the activities of the United Nations Programme on Space Applications. The Subcommittee noted that the 1994 activities of the Programme had been carried out satisfactorily, and that upon the recommendation of COPUOS the activities scheduled for 1995 had been endorsed by the General Assembly in its resolution 49/34 of 9 December 1994. The Subcommittee recommended to COPUOS, for its approval, the activities scheduled for 1996 under the regular budget, and took note of other activities of the Programme, all of which are to be implemented as part of the space-applications-related recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82), as proposed by the Expert on Space Applications in his annual report (A/AC.105/595) submitted to the Scientific and Technical Subcommittee at its 1995 session. The present report reviews the steps taken to date to translate the mandate of the Programme into operational activities.

## I. MANDATE OF THE PROGRAMME

2. The General Assembly, in its resolution 37/90 of 10 December 1982, took into account the recommendations of UNISPACE 82, and expanded the mandate of the Programme to include, in particular, the following elements: (a) provision of assistance in the development of indigenous capability at the local level; (b) provision of long-range fellowships for in-depth training; (c) provision of technical advisory services to Member States and regional institutions upon request; (d) organization of regional and international training courses, seminars, workshops, conferences and technical expert meetings for the benefit of specialists, educators, managers and decision makers in order to enhance their technical capabilities and keep them abreast of ongoing developments in the discipline; (e) acquisition and dissemination of space-related information; and (f) promotion of greater cooperation between developed and developing countries, as well as among developing countries. Presented below are summaries of the activities carried out within the mandate of the Programme in 1995, those scheduled for implementation in 1996 and those proposed for 1997.

### A. Development of indigenous capability

3. A major prerequisite to successful space technology applications, in the developing countries, is the development of various essential indigenous capacities, particularly human resources, within each region. In recognition of such a prerequisite, the General Assembly, in its resolution 45/72 of 11 December 1990, endorsed the recommendation of COPUOS that:

> "... the United Nations should lead, with the active support of its specialized agencies and other international organizations, an international effort to establish regional centres for space science and technology education in existing national/regional educational institutions in the developing countries" (A/AC.105/456, annex II, para. 4 (n)).

4. A progress report (A/AC.105/498) on the establishment of the centres was prepared in early 1992. An updated project document (A/AC.105/534) on the same subject was issued in January 1993. A booklet entitled "Centres for space science and technology education - Education curricula", prepared by the Office for Outer Space Affairs of the United Nations and currently under peer review, will be published in 1996.

#### *1. Goal of the centres*

5. Each centre is conceived as an institution that should offer the best possible education, research and applications programmes, opportunities and experience to the participants in all its programmes. Thus the

principal goal of each centre is the development of the skills and knowledge of university educators and research and applications scientists, through rigorous theory, research, applications, field exercises, and pilot projects in those aspects of space science and technology that can contribute to sustainable development in each country.

### *2. Programme of the centres*

6. The initial programmes of each centre should focus on (a) remote sensing and geographic information systems, (b) meteorological satellite applications, (c) satellite communications and geopositioning systems, and (d) space and atmospheric sciences. Its data management unit should be linked to existing and future relevant global databases. Each centre should also foster continuing education programmes for its graduates and awareness programmes for policy and decision makers and for the general public.

7. The activities at each centre will be undertaken in two major phases. Phase 1 will emphasize the development and enhancement of the knowledge and skills of university educators and research and application scientists in both the physical and natural sciences as well as in analytical disciplines. That will be accomplished over a nine-month period as laid out in the curricula of the education programme of each centre. Phase 2 will focus on ensuring that the participants make use of the skills and knowledge gained in phase 1 in their pilot projects, which are to be conducted, over a one-year period, in their own countries.

8. The activities and opportunities provided in the two phases should result in the development and growth of capacities that will enable each country to enhance its knowledge, understanding, and practical experience in those aspects of space science and technology that have the potential for a greater impact on its economic and social development, including the preservation of its environment.

### *3. The participating scholars*

9. The importance of having a sound academic background, experience and an aptitude for engaging in the different activities of the centre cannot be overstressed. Being highly qualified in those three respects would have a positive impact on the performance of the applicant at the centre. In order for the centres to become model institutions that are respected both within their regions and around the world, they would need to meet internationally recognized standards. To promote the achievement of those aims, the United Nations and the Government of Spain, in early 1995, jointly organized a workshop to draw up model curricula for the centres (see paragraph 4). The model curricula provide the centres with a benchmark of the level of academic performance needed to meet the standards required to achieve international recognition.

### *4. Responsibilities of participating countries to the scholars*

10. Of equal importance is the future of the participating scholars in their own countries upon completion of their studies at the centres. It should be emphasized that the overall mission of the centres is to assist participating countries in developing and enhancing the knowledge and skills of their people in relevant aspects of space science and technology, so that returning scholars can effectively contribute to national development programmes. To provide suitable employment for the returning scholars, the sponsoring Governments or institutions would need to promote development-oriented activities that make use of their newly acquired knowledge and skills, to establish appropriate infrastructure, and to make the necessary arrangements for their careers on a long-term basis. The sponsoring Governments would also need to ensure that returning scholars remain employed, with appropriate levels of remuneration and benefits, for a minimum of 3 to 5 years.

### *5. Operation of the centres*

11. Once a host country is identified for the centre in a given region, the process of inaugurating and establishing the centre, including its governing board, is set in motion by the host country itself.

12. The governing board is the general policy-making body of the centre, overseeing all aspects of its activities. It is composed of representatives of those States of the region in which the centre is established that have agreed to its goals and objectives, through their endorsement of the agreement that establishes the centre, and are fully committed to work, in cooperation with other States of the region, for the success of the centre. A governing board thus constituted is necessary for each centre, because the member States and their citizens are more familiar with their own specific needs, aspirations, capabilities and resources, and better equipped to find solutions to any local problems that may arise.

13. Since the General Assembly, in its resolution 45/72, specifically limits the role of the United Nations to leading international efforts to establish the centres, the governing board, once the location of a centre is determined, will assume all powers of decision-making and policy formulation for the centre. Moreover, as the centre will have arisen through the efforts of the United Nations, the latter, together with the relevant regional economic commission, will serve the centre and its governing board in an advisory capacity.

### *6. Location of the centres*

*(a) Africa*

14. After careful consideration of all the offers and commitments made by six potential host countries for centres in Africa, a favourable response was given to proposals for ensuring the early establishment, operation and long-term viability of a centre in Morocco for the countries of French-speaking Africa, and in Nigeria for those of English-speaking Africa. On 15 September 1995, both countries were invited to undertake the necessary steps for the establishment of the centres. The statement made by the Office for Outer Space Affairs in that connection is contained in annex I to the present report.

*(b) Asia and the Pacific*

15. On 1 November 1995, the Centre for Space Science and Technology Education in the Asia and the Pacific region was inaugurated at New Delhi with the signing of an agreement by 10 countries of the region. The first meeting of the Governing Board of the Centre was held at New Delhi on 2 November 1995. Representatives of a number of countries that were still awaiting the necessary clearance from their Governments on the signing of the agreement attended the meeting as observers. All States of the region were invited to sign the agreement, join the Governing Board, and participate in the activities of the Centre. The first group of scholars will be admitted to the Centre in early 1996.

*(c) Latin America and the Caribbean*

16. At the 17th and 18th meetings of the Fourth Committee of the General Assembly, held in November 1995, Brazil and Mexico informed the Committee that they had both reached agreement on all aspects relating to the establishment of a centre. The only pending issues were the modalities and scope for affiliation with the United Nations.

*(d) Western Asia*

17. Negotiations are in progress with the parties concerned on the establishment of a regional centre.

### *7. Affiliation with the United Nations*

18. Following a review of the work of the Fourth Committee, the General Assembly, in its resolution 50/27 of 6 December 1995, endorsed the recommendation of the Committee that "these centres be established on the basis of affiliation to the United Nations as early as possible and that such affiliation would provide the centres with the necessary recognition and would strengthen the possibilities of attracting donors and of establishing academic relationship with national and international space-related institutions".

## B. Long-term fellowship programmes for in-depth training

19. The Programme received 15 long-term fellowship offers for 1995/96 from the Government of Brazil (10), as well as from the European Space Agency (ESA) (5). The status of the awards for 1995/96 is reflected in annex III to the present report. The awards cover monthly allowances for room and board, books, local travel and health benefits. The fellowship programmes offered are described below in further detail.

20. The 10 long-term fellowships offered by the Government of Brazil are for research and applications in remote sensing technology, and are tenable at the Instituto Nacional de Pesquisas Espaciais, São José dos Campos, Brazil.

21. The five ESA long-term fellowships are each for a period of one year of research and study at ESA institutions and in the disciplines described below:

(a) One fellowship in space antennas and propagation, one in communications systems and one in remote sensing instrumentation, each tenable at the European Space Research and Technology Centre, Noordwijk, Netherlands;

(b) Two fellowships in remote sensing information systems, tenable at the European Space Research Institute, Frascati, Italy.

The fellowship awards for 1996/97 were advertised in December 1995. Selected candidates will begin their studies in September 1996 at the above-mentioned ESA institutions.

## C. Technical advisory services and promotion of regional cooperation

22. The Programme is now entering a phase that will be devoted to the expanded provision of technical advisory services. The latter is fuelled by the following four factors:

(a) The developmental support needed for the centres for space science and technology education;

(b) Advances in communications technology and related information systems, and in the technology of earth observation systems, particularly microwave remote sensing, and the need to prepare Member States for this new phase of Earth observation;

(c) Follow-up projects that have resulted from different activities of the Programme;

(d) Increasing requests for the services of the Programme by national and regional entities.

23. Various technical advisory services currently being rendered under the auspices of the Programme are described below.

### *1. COTOPAXI*

24. As a follow-up to the Workshop on Space Technology for Resource Development and Environmental Management, jointly organized by the United Nations and the Government of Japan and held at Quito in 1992, the Programme has been cooperating since 1993 with the Junta del Acuerdo de Cartagena and the Corporación Andina de Fomento, bodies established by the Governments of Colombia, Ecuador and Venezuela, as well as with the Caribbean Community, to establish a Multinational Andean Enterprise. The pre-feasibility study on the establishment of a multinational Andean organization that will facilitate the operation and utilization of the COTOPAXI ground station and its services has been completed. The International Technical Commission of the Andean group was scheduled to meet in early 1996 to consider the action to be taken on the basis of the study.

### *2. Africa: a cooperative information network*

25. Within the framework of the Programme, the Office for Outer Space Affairs has responded to a recommendation on the establishment of efficient communication links between African scientists and professionals, adopted at a regional conference organized by the United Nations and held at Dakar in 1993, with a proposal to establish a Cooperative Information Network Linking Scientists, Educators and Professionals in Africa, known as COPINE. Through the implementation of a satellite-based information system, the immediate aim of COPINE would be to improve the collection, transmission, distribution and exchange of information, particularly in such areas as health care, agricultural research and development, management of natural resources and the environment, education and science and technology. In any of the participating countries, the COPINE system could be developed to include capabilities for electronic mail services such as Internet and for voice communications (subject to approval by the local post, telegraph and telephone service). The primary focus of COPINE, however, is the use of its wideband capabilities to provide a variety of information delivery services, particularly computer file transfer, interactive data transfer, document transmission, and imagery and video transmissions, including video conferencing, distant learning and telemedicine. The Office of Outer Space Affairs planned to send, in late January 1996, an evaluation mission on user needs to the targeted countries that have confirmed their readiness to participate in the project. The report on the mission will be used to finalize the COPINE project document, which will subsequently be submitted for consideration to potential contributors in March 1996.

### *3. Follow-up to the series of UN/ESA ERS training courses*

26. The United Nations, through the Department of Development Support and Management Services, the Office for Outer Space Affairs and the United Nations Programme on Space Applications, and ESA have followed up a previous request and jointly initiated a technical assistance programme that would strengthen the capability of a number of institutions in developing countries. The technical assistance programme would make it possible for the institutions of the participants in the series of training courses to obtain satellite, radar and optical data to support ongoing projects in their countries, as well as hands-on training in the use of such data. Where necessary, the programme would also provide software modules and possibly hardware components so that the data could be fully utilized.

27. In addition to the training and practical results that would directly benefit those who participate in the technical assistance programme, one of its main objectives is to enable the participants to demonstrate to their decision makers, in management terms, the cost-effectiveness of utilizing satellite data and to highlight the value and impact that such information could have in the planning and management of future projects.

28. Data needs of several ongoing projects have been submitted to the United Nations and ESA by participants in the first two training courses held at the ESA European Space Research Institute (ESRIN) at Frascati, Italy. The first series of submissions have come from Latin America, and have been integrated thematically into modules which the co-sponsors will present to potential contributors. A similar process is

currently under way for Africa through input that is being received from participants in other courses jointly organized by the United Nations and ESA in the region, in particular the training course held in 1995 on the use of European Remote Sensing Satellite (ERS) data for the mapping and inventory of resources in Africa (see paragraphs 46-50). The technical assistance programme is to be subsequently extended to include regional commissions of the United Nations through participation in courses organized by the United Nations and ESA at Frascati and elsewhere.

### *4. Asia-Pacific Satellite Communications Council*

29. The United Nations Programme on Space Applications was closely associated with the Asia-Pacific Satellite Communications Council (APSCC) from its conception in 1992, through its gestation period, to its birth at Seoul in October 1994. APSCC was established to address a number of concerns within the Asia-Pacific region, among which are the following needs:

(a) To promote cooperation and harmonization in the development and utilization of satellite communications in the region;

(b) To facilitate access to information by island States, and to enhance regional cooperation;

(c) To bridge the gaps between groups with competing interests, particularly those institutions or organizations which are mostly interested in the technical and business aspects of telecommunications.

30. According to its proponents, APSCC should champion the provision of satellite services to rural areas in the region, and also play a leading role on a number of technical and regulatory issues in order to achieve an integrated information infrastructure in the region. Through the commitment of its members and the support of the international community, APSCC can assist the region in facing the opportunities and challenges ahead.

31. As of 31 October 1995, membership of APSCC had grown to 40, and had spread from the Asia-Pacific geographical area to Europe and North America. At its session held in 1995, the Council of the International Telecommunication Union (ITU) approved the application of APSCC for membership and added APSCC to its list of international organizations (ITU "Notification No. 1332", dated 10 July 1995).

### *5. Follow-up to the series of workshops on basic space science organized by the United Nations and ESA*

32. Since 1991, the Programme has been conducting a series of annual workshops on basic space science that have addressed a variety of topics, including the worldwide development of planetary exploration and astronomy, which are two items on the agenda of the Committee. The workshops focus in particular on education, research and cooperation as prerequisites for the development of space science and technology capabilities at the national, regional and international levels. The reports of the workshops, which were held in India (1991), Colombia and Costa Rica (1992), Nigeria (1993) and Egypt (1994), are contained in documents A/AC.105/489, A/AC.105/530, A/AC.105/560 and A/AC.105/580, respectively. Projects that have resulted from the deliberations of the workshops, and which are enhancing regional and international cooperation, include the following:

(a) The inauguration in Sri Lanka, in January 1996, of an astronomical telescope donated by Japan;

(b) The operation of an astronomical observatory in Honduras;

(c) The development of an Inter-African Astronomical Observatory and Science Park on the Gamsberg in Namibia;

(d) The upgrading of the Kottamia Observatory in Egypt.

### D. Training courses, workshops, conferences and symposia organized by the United Nations

#### *1. Activities carried out in 1995*

33. In 1995, one expert group meeting, three training courses, three workshops, one symposium and one conference were conducted under the auspices of the Programme. A summary of each of those activities is given in annex II to the present report.

#### *2. Activities scheduled for implementation in 1996*

34. The training courses and workshops scheduled for 1996 are shown in annex III.

#### *3. Activities proposed for implementation in 1997*

35. The following training courses and conferences are proposed for 1997:

(a) Seventh United Nations/Sweden International Training Course on Remote Sensing Education for Educators;

(b) Second United Nations Workshop on Payloads on Small Satellites;

(c) United Nations International Training Course on Communications and Information Technology for Development;

(d) Fourth United Nations/ESA Training Course on ERS Data Applications;

(e) A United Nations workshop on space technology as a tool for cleaning up and rehabilitating the environment.

36. The implementation of the above-mentioned activities may be affected by the decision of the General Assembly on the organization of a third United Nations conference on the exploration and peaceful uses of outer space.

### E. Space information

37. The 1996 edition of *Seminars of the United Nations Programme on Space Applications*, the seventh in the series of selected papers from the activities of the Programme, has been issued as document A/AC.105/621.

## II. VOLUNTARY CONTRIBUTIONS

38. The successful implementation of the activities of the Programme in 1995 benefited from the support and voluntary contributions of Member States of the United Nations and their institutions, as well as from the assistance and cooperation of regional and other international governmental and non-governmental organizations. In 1995, the Programme received voluntary contributions, both in money and in kind, including the sponsorship of technical and scientific presentations by several experts, as described below.

39. A number of Member States (Austria, Brazil, Canada, France, Gabon, Germany, Italy, Japan, Mexico, Norway, Spain, Sweden, United Kingdom of Great Britain and Northern Ireland, United States of America and Zimbabwe) and governmental and non-governmental organizations (Department of Development Support

and Management Services, Department of Humanitarian Affairs, United Nations Educational, Scientific and Cultural Organization, United Nations Environment Programme, International Telecommunication Union, Commission of the European Communities, ESA, GlobalStar, Inter-American Development Bank, International Centre for Theoretical Physics, International Federation of Red Cross and Red Crescent Societies, International Maritime Satellite Organization, International Telecommunications Satellite Organization, Nippon Electric Company, Nuova Telespazio, Volunteers in Technical Assistance (VITA) provided support for the activities of the Programme in 1995 in various ways, including the following:

(a) Defrayal of the local expenses of candidates from developing countries in the long-term fellowship programmes (see paragraph 19 and annex II);

(b) Voluntary cash contributions of $20,000 were received in 1995 from the Government of Austria in support of the activities of the Programme, and of $25,000 from the Government of Spain in support of the Meeting of Experts on the Development of Education Curricula, held at Granada, Spain, from 27 February to 3 March 1995;

(c) A financial contribution of $100,000 was received from ESA in support of the workshop, training course and conference held at Libreville, Harare and Puerto Vallarta, Mexico, as well as the Workshop on Basic Space Science rescheduled to take place at Colombo in January 1996;

(d) Co-sponsorship of the activities of the Programme and, in particular, the defrayal of the costs of international air travel of participants, local organization and facilities, room and board, and local transportation (see annex II);

(e) Sponsorship (travel and daily subsistence allowance) of experts from Member States to make technical presentations and take part in deliberations on the activities of the Programme (see annex II).

## III. RESULTS OF THE IMPACT OF THE UNITED NATIONS/SWEDEN TRAINING COURSES ON REMOTE SENSING EDUCATION FOR EDUCATORS HELD IN 1990, 1992 AND 1993

40. In order to assist in adjusting the scope of an activity organized by the Programme and to determine whether a particular activity is geared towards the development of capabilities in a given country, the Office of Outer Space Affairs seeks the views of those who have participated in the activities of the Programme.

41. To respond effectively to the needs of the international community, the co-sponsors of the annual United Nations/Sweden course on remote sensing education for educators decided to seek the views of those who participated in the course on the impact of the training programme on their performance and on productivity in their home countries. A questionnaire was sent to the participants in the courses held in 1990, 1992 and 1993, as it was felt that sufficient time had passed for them to judge the impact of the course. Out of 75 participants, a total of 53 replied. The participants were educators from African, Asian and Latin American institutions. The responses have been collated and summarized in document A/AC.105/616.

42. The overall response of the participants has been very positive. The responses demonstrated that the course has enhanced indigenous capabilities, particularly in remote sensing, in many countries.

## IV. FINANCIAL PROVISIONS AND ADMINISTRATION OF ACTIVITIES IN 1996

43. The activities of the Programme in 1996 covered in the present report will be implemented as follows:

(a) *Financial provisions.* Under the United Nations regular budget, a sum of $446,200 was approved by the General Assembly at its fiftieth session for implementing the activities of the Programme during the biennium 1996-1997. In order to effectively carry out its mandated and expanded activities, it has become necessary for the Programme to solicit additional funds, in the form of voluntary contributions, in support of its activities. Those contributions will be used to supplement the regular budget of the Programme;

(b) *Administration by and contributions and participation of staff.* The Office for Outer Space Affairs, and in particular the Expert on Space Applications and his staff, will carry out the activities described in the present report. In that connection, travel will be undertaken as appropriate by the Expert and his staff under the provisions of the travel budget of the Office for the biennium, as approved by the General Assembly at its fiftieth session, and as necessary from voluntary contributions;

(c) *Consultations, instructors, speakers and technical materials.* Up to 30 specialists (necessitated, in particular, by the work associated with the establishment and operation of the regional centres for space science and technology education) will be required to serve as instructors, speakers and consultants during the implementation of the activities of the Programme in 1996. Expenses incurred in respect of the travel and per diem of the specialists and for necessary technical materials will be met partly from the regular budget and partly from voluntary contributions received from Member States and international organizations.

*Annex I*

## ESTABLISHMENT AND LOCATIONS OF THE CENTRES FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION IN AFRICA

### Statement by the Office for Outer Space Affairs of the United Nations*

1. In response to the General Assembly's endorsement of the recommendation of UNISPACE that the United Nations Programme on Space Applications should assist member States in enhancing their indigenous capability at the local level, the Office for Outer Space Affairs developed a proposal for the establishment of Centres for Space Science and Technology Education in the developing countries. The objective of these Centres is to enhance the capabilities of member States, including those in Africa, in different areas of space science and technology, capabilities that can advance their social and economic development. Thus, each of the Centres will provide in-depth education, research and applications programmes with initial emphasis on remote sensing, satellite communications, satellite meteorology, geo-positioning systems and atmospheric sciences, for university educators, research and application scientists. The concept of the Centre calls for it to offer the best possible education, research and applications experience to the participants in its programme. Permanent and visiting staff from countries both within and outside the region would contribute to the attainment of these elements of the Centre's programme. This proposal was presented to the Committee on the Peaceful Uses of Outer Space (COPUOS) through its Scientific and Technical Subcommittee at their 1990 sessions.

2. On 11 December 1990, in its resolution 45/72, the General Assembly endorsed the Committee's recommendation that "the United Nations should lead, with the active support of its specialized agencies and other international organizations, an international effort to establish regional centres for space science and technology education in existing national/regional educational institutions in the developing countries".

3. In translating the decision contained in the above resolution of the General Assembly into an operational programme, the Office for Outer Space Affairs (herein referred to as the Office), requested a timely indication, by all member States in Africa, of their interest to host such a Centre in the region. Six countries (Ghana, Kenya, Morocco, Nigeria, Senegal and Zimbabwe) responded and offered to host such a Centre, one for the English speaking and one for the French speaking countries of Africa.

4. The Office took three steps in order to identify the host countries for these Centres. These steps included the following:

(a) In, March/April 1993, two United Nations evaluation missions, consisting of two teams of experts, respectively went to the above anglophone and francophone African countries. Each of these missions met with Government and institutional representatives and in each case conducted a detailed analysis of the elements offered by each of the six potential host countries. These elements included the physical infrastructure (i.e. academic, research and living facilities), financial support, equipment available on a dedicated or shared basis, existing space science and technology-related education programmes and experience, the degree to which the proposed concept of the Centre could be fulfilled, the level of governmental and institutional support that would be provided for the Centre, existing/planned communications systems, administrative and academic autonomy offered to the Centre, local expertise and experience available to the Centre, and language (*vis a vis* the rest of the region).

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(b) At the request of the Office, the United Nations Economic Commission for Africa (ECA) recommended four experts, who reviewed the reports of the missions. These experts made their recommendations to the Office . Their analyses of the reports of the evaluation missions showed that a number of essential elements that are necessary to sustain the Centres were not fully addressed in the submissions provided by most of the countries visited; and

(c) Accordingly, on 31 March 1995, the Office for Outer Space Affairs requested each of the six potential host countries to provide by 30 June, 1995:

(i) Details of the role of in-country academic and research institutions and associated centre(s) in the work programme of the proposed Centre for Space Science and Technology Education in Africa, including the brochures and booklets showing the academic and research programmes of such institutions;

(ii) A detailed financial plan being offered by each country that will ensure the long-term sustainability of the Centre; and

(iii) The vision of each country for this Centre, and its plan for ensuring that, if located within its territory, the Centre will serve the overall interest of all the countries (anglophone or francophone) in Africa.

5. The overall (a) offers and commitments of each of these six countries in support of these Centres, (b) the reports of the evaluation missions, and (c) the recommendations of the experts proposed by ECA, all showed that in order to attain its objectives, a Centre for Space Science and Technology Education be established in Morocco for the benefit of Africa's francophone countries, and a Centre for Space Science and Technology Education be established in Nigeria, for the benefit of Africa's anglophone countries. The aforementioned offers and commitments of both Morocco and Nigeria assure, in each case, (i) an early establishment of each of these Centres, in these two countries, and (ii) their long-term sustainability.

6. Coordination of the programmes of each of these two Centres will be carried out by its Governing Board which will be regional in its composition. The Governing Board of each Centre is its overall policy making body; it will oversee all aspects of the Centre including the adoption of its academic programme, and determination of its budget, personnel, and future direction. The Office for Outer Space Affairs will be requesting both Morocco and Nigeria, the host countries of these Centres to each develop, expeditiously, a draft agreement to be discussed, adopted and entered into by all the francophone participating countries, in the case of Morocco, and by all the anglophone participating countries, in the case of Nigeria. Each of these draft agreements shall embody such issues as the specific goals and objectives of each Centre and the structure of its personnel and Governing Board, such as contained in UN document A/AC.105/534 of 7 January 1993, and shall include provisions for the future direction of each of these two Centres as regional institutions.

Office for Outer Space Affairs
United Nations Office at Vienna
Vienna, Austria
15 September 1995

*Annex II*

## SUMMARY OF UNITED NATIONS TRAINING COURSES, WORKSHOPS, CONFERENCES AND SYMPOSIA CARRIED OUT IN 1995

| *Title, location and date* | *Sponsoring country/ organization (host institute)* | *(a) Funding and nature of support*<br>*(b) Number of participating countries and organizations*<br>*(c) Total number of participants* | *Outcome of activity* |
|---|---|---|---|
| United Nations/Spain Meeting of Experts on the Development of Education Curricula for the Regional Centres for Space Science and Technology Education<br>Granada, Spain<br>27 February-3 March 1995 | Government of Spain and United Nations<br><br>(University of Granada) | (a) Air travel and daily subsistence allowance (United Nations and Spain); conference facilities, equipment and local transportation (University of Granada, Spain);<br>(b) 19 countries and international organizations<br>(c) 26 participants | The objective of this meeting was to develop model curricula for the regional centres for space science and technology education in four particular fields: (a) remote sensing; (b) satellite communications; (c) meteorological satellite applications; and (d) space and atmospheric sciences. The education curricula that emanated from this meeting are currently undergoing peer review and will be published in 1996 as a booklet for the Regional Centres for Space Science and Technology Education. |
| Fifth United Nations International Training Course on Remote Sensing Education for Educators<br>Stockholm and Kiruna, Sweden<br>2 May-9 June 1995 | Government of Sweden and United Nations<br><br>(Stockholm University, Swedish Space Corporation (SSC) Satellitbild) | (a) Air travel (United Nations and Sweden)<br>All other expenses<br><br>(Swedish International Development Agency, Sweden)<br><br>(b) 13 countries<br><br>(c) 25 participants | The course was conducted specifically for the benefit of university educators from developing countries with the objective of enabling them to introduce elements of remote sensing technology in the curricula of their respective academic institutions. An evaluation of the course by the participants revealed the following: a) all participants wanted more time to be devoted to practical exercises; (b) 80% agreed that the course was well conceived; (c) 70% felt that they had benefited significantly from the course; and (d) 90% agreed with the course duration. Lack of adequate funds to purchase necessary equipment may create difficulties in applying the newly acquired knowledge on the job. OOSA proposed an examination of the possibility of organizing a more advanced course for remote sensing educators, during which operational computer techniques in the application of remotely sensed data will be emphasized. Detailed report contained in document A/AC.105/617. |

| *Title, location and date* | *Sponsoring country/ organization (host institute)* | *(a) Funding and nature of support*<br>*(b) Number of participating countries and organizations*<br>*(c) Total number of participants* | *Outcome of activity* |
|---|---|---|---|
| United Nations/ESA Training Course on the use of ERS-1 Data for the Mapping and Inventory of Natural Resources in Africa<br>Libreville, Gabon<br>15-19 May 1995 | Government of Gabon, United Nations and European Space Agency | (a) Air travel and subsistence allowance (United Nations and ESA); secretarial support and local transportation (Gabon)<br><br>(b) 14 countries<br><br>(c) 25 participants | Discussions at the Course addressed the need to enhance the use of ERS data by the countries within the region. The following recommendations were made: (a) participants should have access to more in-depth training on radar image interpretation; (b) a follow-up training course should be organized to share operational experience in the application of ERS data; (c) countries within the region should have access to ERS images collected by the Libreville station; (d) south-south and north-south cooperation in matters related to ERS data should be promoted and strengthened; (e) training should be given in geographic information systems (GIS) and the integration of radar and other remote sensing data in such systems; (f) countries within the region should have access to technical assistance in matters related to the exploitation of radar images within an operational setting; and (g) national and regional institutions should be invited to participate in the demonstration studies using ERS data from the Libreville station. Detailed report contained in document A/AC.105/613. |
| United Nations/ESA Workshop on the Applications of Space Techniques to Prevent and Combat Disasters<br>Harare, Zimbabwe<br>22-26 May 1995 | Government of Zimbabwe, Environment and Remote Sensing Institute (ESRI), United Nations and European Space Agency<br><br>(ESRI, Scientific and Industrial Research and Development Centre (SIRDC) of Zimbabwe) | (a) Air travel and subsistence allowance (United Nations and ESA); conference facilities (ESRI, Zimbabwe)<br><br>(b) 26 countries and international/ regional organizations<br><br>(c) 69 participants | The Workshop addressed the use of space capabilities, separately or collectively, to prevent disasters and to forecast, monitor and mitigate the effects of severe weather phenomena. It also addressed the extent to which the same technologies could mitigate the effects of earthquakes and volcanic eruptions. The Workshop concluded with discussions on the needs of the emergency response services, the capabilities of space technology to satisfy those needs and the actions that would be necessary in the short- and medium-term to take advantage of those capabilities. Detailed report contained in document A/AC.105/610. |

| *Title, location and date* | *Sponsoring country/ organization (host institute)* | *(a) Funding and nature of support*<br>*(b) Number of participating countries and organizations*<br>*(c) Total number of participants* | *Outcome of activity* |
|---|---|---|---|
| United Nations/ESA/Austria Symposium on Space Technology for Improving Life on Earth<br>Graz, Austria<br>11-14 September 1995 | Government of Austria, United Nations, Commission of European Communities and European Space Agency<br><br>(Technical University of Graz) | (a) Air travel and subsistence allowance (Austria, United Nations, CEC, ESA)<br><br>(b) 38 countries and international organizations<br><br>(c) 64 participants | The Symposium addressed how satellite remote sensing and satellite communications could provide accurate and timely information which is essential for policy formulation and effective decision-making. The Symposium also covered case-study and pilot project illustrations on the use of satellite technology to enhance food security, communications infrastructure, education, health and disaster early warning systems. Detailed report contained in document A/AC.105/615. |
| United Nations/IAF Space Technology for Health Care and Environmental Monitoring in the Developing World<br>Oslo, Norway<br>28 September-1 October 1995 | Government of Norway, United Nations, Commission of European Communities, European Space Agency and International Astronautical Federation<br>(Norwegian Space Centre) | (a) Air travel and subsistence allowance (Norway, United Nations, CEC, ESA)<br><br>(b) 38 countries and international organizations<br><br>(c) 77 participants | Successful models of space applications were presented at the Workshop. The Workshop addressed how developing countries could use space technologies, including remote sensing and space communications systems for health care, environmental monitoring and economic and social development. Detailed report contained in document A/AC.105/612. |
| United Nations/ESA Regional Conference on Space Technology for Sustainable Development<br>Puerto Vallarta, Mexico<br>30 October-3 November 1995 | Government of Mexico, United Nations, European Space Agency, Instituto Mexicano de Comunicaciones (IMC), Instituto de Geografía, Universidad Nacional Autónoma de México | (a) Air travel and subsistence allowance (United Nations, ESA, IMC)<br><br>(b) 24 countries and international organizations<br><br>(c) 66 participants | The participants became familiar with the role that Earth observing satellites can play in the timely collection and analysis of data. They also addressed how the results obtained from such an analysis can be translated into vital information for enhancing the decision-making process as well as in the planning and executing of operationally viable strategies for sustainable development, for monitoring and managing the environment or for use in global change studies. The participants also became familiar with the important role that communication satellites can play in enhancing the economic and social welfare of a country. The Conference concluded with specific recommendations that can be followed up individually or collectively by the participating institutions. Detailed report contained in document A/AC.105/622. |

| *Title, location and date* | *Sponsoring country/ organization (host institute)* | *(a) Funding and nature of support*<br>*(b) Number of participating countries and organizations*<br>*(c) Total number of participants* | *Outcome of activity* |
|---|---|---|---|
| United Nations/ESA International Training Course for Asia and the Pacific Countries on Applications of ERS-1 Data<br>Frascati, Italy<br>13-24 November 1995 | United Nations and European Space Agency<br><br>(ESA European Space Research Institute, Frascati) | (a) Air travel and subsistence allowance (United Nations, ESA); facilities and technical support (ESA/ESRIN)<br><br>(b) 14 countries and international organizations<br><br>(c) 14 participants | The Course (a) provided all participants with a theoretical basis and practical experience in various aspects of microwave remote sensing, focusing on the applications of that technology to natural resources, sources of renewable energy and its use in conducting inventories and monitoring the environment, and (b) familiarized the participants with the bibliography and archives of ERS materials and data that are available at the ESRIN facility at Frascati. The Course also included the theory and concepts of synthetic aperture radar image formation and an introduction to the applications of radar data in oceanographic, geologic, topographic and cartographic surveys. Detailed report contained in document A/AC.105/623. |
| United Nations/International Centre for Theoretical Physics (ICTP) Space Science and Technology<br>Trieste, Italy<br>20-24 November 1995 | United Nations and ICTP<br><br>(ICTP) | (a) Air travel (United Nations); hotel accommodation, subsistence allowance, technical support and conference facilities (ICTP)<br><br>(b) 25 countries and international organizations<br><br>(c) 52 participants | The Conference focused on the applications of optics in space science and technology, with special attention to the current and future developments in space-based optical instruments that are used in remote sensing, telecommunications, astronomy and astrophysics. Matters related to education in space technology and to the development of international cooperation between scientists working in those fields were also considered by the Conference. Detailed report contained in document A/AC.105/623. |

*Annex III*

## LONG-RANGE FELLOWSHIPS OFFERED BY BRAZIL AND THE EUROPEAN SPACE AGENCY WITHIN THE FRAMEWORK OF THE UNITED NATIONS PROGRAMME ON SPACE APPLICATIONS, 1995-1996

| *Period* | *Country or organization* | *Subject* | *Financial support by host country or organization* | *Fellowships offered* | *Candidates selected* | *Applications submitted* | *User countries (one or more candidates selected)* |
|---|---|---|---|---|---|---|---|
| 1995/96 | Brazil | Research and applications in remote sensing | Subsistence allowance, medical and accident insurance | 1995<br>10<br><br>1996<br>10 | 6<br><br>Selection in process | <br><br>Selection in process | Costa Rica -1<br>Venezuela -2<br>Peru -2<br>Colombia -1 |
| 1995/96 | ESA | Space antennas and propagation | Subsistence allowance | 1 | 1 | 19 | Lebanon |
| 1995/96 | ESA | Remote sensing information | Subsistence allowance | 2 | 2 | Participation by ESA's direct invitation<br><br>20 | Pakistan<br>Turkey |
| 1995/96 | ESA | Communications system | Subsistence allowance | 1 | 1 | 20 | China |
| 1995/96 | ESA | Remote sensing instrumentation | Subsistence allowance | 1 | 1 | 7 | Pakistan |

*Annex IV*

## UNITED NATIONS PROGRAMME ON SPACE APPLICATIONS: 1996 SCHEDULE OF TRAINING COURSES, WORKSHOPS, CONFERENCES AND SYMPOSIA

| *Activity Number* | *Activity* | *Date and Place* | *Objective* |
|---|---|---|---|
| 1 | United Nations/ESA Workshop on Basic Space Science | 11-13 January 1996<br>Colombo<br>**(Sri Lanka)** | To inaugurate the telescope facility at the Arthur C. Clarke Center for Modern Technologies in Sri Lanka, the Workshop is focusing on education and research with small astronomical telescopes and their worldwide networking |
| 2 | United Nations/USA International Conference on Spin-off Benefits of Space Technology: Challenges and Opportunities | 9-12 April 1996<br>Fort Collins, Colorado<br>**(United States of America)** | To address the new opportunities in the transfer of space-related technologies to traditionally Earth-based industries and the ways in which developing countries can participate in and benefit from such efforts |
| 3 | United Nations/ESA Workshop on Microwave Remote Sensing Applications | 22-26 April 1996<br>Manila<br>**(Philippines)** | To expose participants to various aspects of current and future microwave remote sensing systems and applications of radar data to natural resources exploration and environmental monitoring |
| 4 | Sixth United Nations/Sweden international Training Course on Remote Sensing Education for Educators | 6 May-14 June 1966<br>Stockholm and Kiruna<br>**(Sweden)** | To develop the knowledge and skills of university educators in remote sensing technology and to equip the participants with an ability to introduce elements of the technology, as appropriate, in the academic curricula of their own universities and institutes |
| 5 | United Nations/Chile/ESA Regional Workshop on Space Technology for Prevention and Mitigation of the Effects of Disasters | 1-5 July 1996<br>Santiago<br>**(Chile)** | To consider the ways in which Latin American and Caribbean countries can use technology to prevent and mitigate natural disasters |
| 6 | XVIII Congress of the International Society for Photogrammetry and Remote Sensing (ISPRS) (United Nations/ISPRS Workshop on High Resolution Data) | 9-10 July 1996<br>Vienna<br>**(Austria)** | To address the issue of commercial high resolution satellites for the enhancement of development and international cooperation |

| *Activity Number* | *Activity* | *Date and Place* | *Objective* |
|---|---|---|---|
| 7 | Thirty-first Scientific Assembly of the Committee on Space Research (COSPAR) | 14-21 July 1996<br>Birmingham<br>**(United Kingdom)** | The Panel on Space Research in the developing countries will identify and seek to understand problem areas for introducing and implementing space science and education at various academic and professional levels |
| 8 | United Nations/Austria/ESA Symposium on the Development and Dissemination of Space Technology | 2-5 September 1996<br>Graz<br>**(Austria)** | To address developments in, and dissemination of, space technologies, including dual-use aspects of technology development, with particular emphasis on the emerging space countries and the contributions they can make to the development of space capabilities in developing countries |
| 9 | United Nations/ESA Workshop on Basic Space Science | 9-13 September 1996<br>Bonn<br>**(Germany)** | To address issues of basic space sciences, focusing on research and education to evaluate the achievements of this series of workshops |
| 10 | United Nations/IAF/ESA/Workshop on Education and Awareness - Space Technology and Application in the Developing World | 3-6 October 1996<br>Beijing<br>**(China)** | To address the use of space technology for distant learning and education in remote and rural areas and for sustainable development in developing countries |
| 11 | United Nations/ESA International Conference on Small Satellite Missions | 9-13 September 1996<br>Madrid<br>**(Spain)** | To focus on payloads in small experimental satellites, with emphasis on types and logistics of design process and system development methods that are associated with these satellites |
| 12 | Second United Nations Regional Conference on Space Technology for Sustainable Development in Africa | 4-8 November 1996<br><br>**(South Africa)** | To focus on (a) current and imminent space technologies relevant to African development, and (b) critical success factors and approaches for successful stimulation and nurturing of space-technology-related knowledge and introduction and adoption of programmes that are critical to African development |